MCI Telecommunications Corporation

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FEDERAL COMMUNICATIONS COMMISSION
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September 24, 1997

Mr. William F. Caton
Secretary
Federal Communications Commission
Room 222
1919 M Street, N.W.
Washington, D.C. 20554

Re: **CC Docket No. 96-45; Federal-State Joint Board on Universal Service CC Docket No. 97-160; Forward-Looking Mechanism for High Cost Support for Non-Rural LECs**

Dear Mr. Caton:

Enclosed herewith for filing are the original and four (4) copies of AT&T Corp.'s and MCI Telecommunications Corporation's Comments in the above-captioned proceeding.

Please acknowledge receipt by affixing an appropriate notation on the copy of the Comments furnished for such purpose and remit same to the bearer.

Sincerely yours,

Chris Frentrup

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Senior Economist
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MCI Telecommunications Corporation

Enclosure

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Federal-State Joint Board on Universal Service	)	CC Docket No. 96-45
	)	
Forward-Looking Mechanism for High Cost Support for Non-Rural LECs	)	CC Docket No. 97-160

COMMENTS OF AT&T CORP. AND
<u>MCI TELECOMMUNICATIONS CORPORATION</u>

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MCI Telecommunications Corporation

September 24, 1997

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SUMMARY

The cost model used by the Commission to compute universal service support must reflect a network that is capable of providing the supported level of service, but does so most economically on a forward-looking basis, consistent with the Commission's quality requirements for supported universal service. The Commission has correctly concluded that the mix of plant will vary based on population density and on terrain characteristics. The Hatfield Model's outside plant algorithm reflects these characteristics, and the Hatfield Model sponsors are preparing further revisions that will allow the mix of plant used to vary based on the relative lifetime costs of the types of plant.

Similarly, the cost model should allow the costs to vary by density zone, with those density zones measured by lines per square mile to take account of all economies of scale in building a telephone network. However, costs should be assumed to vary by density zone only if there are sufficiently granular input data available by density zone. For example, data to determine the areas affected by climate conditions are unlikely to be available.

The structure sharing adopted in the universal service cost model should reflect the forward-looking opportunities for sharing, rather than the incumbent LECs' embedded base of sharing, because that level of sharing does not reflect the incentives that will be faced in a competitive environment. In addition, the cost model should embody a performance rather than a network standard, which will allow the network to use the most efficient design to provide supported services,

such as Hatfield's use of copper T-1 technology to provide service to distant customers in sparsely populated areas. Finally, the Commission can use a wireline model to estimate the cost of universal service for the present, without distorting the marketplace.

Before the
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COMMENTS OF AT&T CORP. AND
MCI TELECOMMUNICATIONS CORPORATION

AT&T Corp. (AT&T) and MCI Telecommunications Corporation (MCI) hereby submit their comments regarding outside plant issues in the above-captioned docket.

I. INTRODUCTION

The cost of outside plant is the major component of the cost of local service, and thus of the total amount of universal service support. The cost model used by the Commission to compute universal service support must reflect a network that is capable of providing the supported level of service, but does so most economically on a forward-looking basis, consistent with the Commission's quality requirements for supported universal service. The Hatfield Model, with the revisions discussed infra, will meet these twin requirements. AT&T and MCI urge the Commission to adopt the approaches taken in the Hatfield Model.

II. THE MIX OF PLANT IN THE MODEL SHOULD REFLECT THE MOST ECONOMIC ALTERNATIVE, CONSISTENT WITH FORWARD-LOOKING NETWORK DESIGN PRACTICES (III.C.2.a. PLANT MIX)

Because the costs of installing aerial, buried, and underground cable and wire facilities vary so greatly, a prime determinant of the cost of any network is the relative proportions of these types of plant. The Hatfield Model properly reflects the differences in these types of costs, and will allow the user to select the mix of plant that is consistent with forward-looking network design practices.

The Commission has concluded that an efficient carrier will vary its plant mix according to the population density of an area.[1] The Hatfield Model currently allows the user to specify the plant mix by density zone, and has default values that vary by zone. For example, a company is likely to use more aerial or buried plant in the less densely populated zones, and more underground plant in more densely populated areas, due to relative costs and zoning requirements.

The Commission tentatively concludes that assignment of plant mix should also reflect terrain factors, and specifically that relatively more feeder and distribution cable should be assigned to aerial installation for all population density groups in wire centers characterized by "hard rock" conditions than in those wire

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1 See Federal-State Joint Board on Universal Service, CC Docket No. 96-45, Forward-Looking Mechanism for High Cost Support for Non-Rural LECs, CC Docket No. 97-160, Further Notice of Proposed Rulemaking, FCC 97-256, released July 18, 1997, (FNPRM) at para. 58. Plant mix refers to the percentages of plant which are aerial, buried, and underground.

centers with other terrain conditions.[2] AT&T and MCI agree that an efficient carrier will base its decision on whether to install aerial, buried, or underground cable on the relative costs of those types of installation, taking into consideration the different "first-cost" and maintenance expenses that are expected to result from the different choices.

The next release of the Hatfield model will incorporate an optimization process whereby the model will, by comparing the lifetime costs of aerial and buried plant, select a mix of these types of plant based on their relative cost. Specifically, the user will be able to input, by density zone, the percentage of plant which is underground, buried, and aerial, based on standard terrain conditions, and the percentages of aerial and buried plant which are "at risk" for shifting to the other type based on relative cost shifts that may arise from non-standard terrain conditions. Thus, for example, the user may specify that for a given density zone, standard terrain conditions will support 20 percent of plant being underground, 40 percent being buried, and 40 percent being aerial, with half of the aerial and buried available to be shifted to the lower cost alternative.[3] The exact percentage of "at-risk" plant in a particular geography that will be shifted will depend on the relative

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2 Ibid.

3 As currently envisioned, the model will not allow plant to be shifted into or out of the underground category, because the percentage of underground plant is primarily determined by factors other than terrain-related relative cost, such as the constraints of providing service in an urban environment, where aerial plant may be limited by law or regulation and buried plant is not desirable because of streets and sidewalks.

life cycle costs of aerial and buried plant, based on the terrain conditions of that geography. These relative costs will consider not only the cost of the initial plant installation, but also the life-cycle maintenance and other expenses of the types of plant. In addition, the percentage of plant actually shifted will depend on the degree to which the cost of buried plant exceeds aerial plant, e.g., a greater relative cost of buried plant will result in a greater portion of the "at-risk" buried plant shifted to aerial.

The Commission also suggests that climate conditions, such as the possibility that a hurricane will destroy aerial plant, may affect an efficient carrier's decision to deploy aerial plant.[4] It is not clear why susceptibility to any one type of climate condition, such as hurricanes, should receive special treatment, while susceptibility to other types, such as earthquakes, ice storms, wind storms, or extreme heat, are not assumed to affect costs. Thus, varying the type of plant used based on climatic conditions would be enormously complex, requiring the Commission to identify which conditions are relevant -- e.g., hurricanes, ice storms, wind storms, extreme heat, etc. -- and to determine which parts of the study area are affected -- e.g., how far inland is affected by hurricanes, how frequent ice storms must be before they affect the decision -- as well as the magnitude of the effect.[5]

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4 Ibid.

5 To the extent that the modeled LEC's ARMIS data reflect expense differences due to climate differences, the Hatfield Model will increase or

AT&T and MCI do not believe these conditions or areas can be readily identified or quantified with any accuracy. Given these data limitations, adding climate condition inputs is unlikely to produce more accurate cost estimates. Accordingly, AT&T and MCI do not recommend that the universal service cost model reflect this factor.

AT&T and MCI also agree with the Commission's finding that more recent installations of outside plant may more closely meet forward-looking criteria.[6] Because structures are generally long-lived plant, changes over time in types of structure take time to filter into the embedded base. The incumbent local exchange carriers' (LECs') embedded base of outside plant reflects decisions they have taken over the years, rather than the decisions a company would make today. Thus, their embedded base is unlikely to reflect the decisions a forward-looking efficient company would make today, or that a competitive firm would be able to reflect in its prices.

III. VARIATION IN COSTS BY DENSITY ZONE SHOULD REFLECT ACTUAL COST DIFFERENCES (III.C.2.b INSTALLATION AND CABLE COSTS)

The Hatfield Model, Release 4.0 (hereinafter, Hatfield 4.0) has revised the treatment of installation costs from the Hatfield Model, Release 3.1, consistently with the guidelines stated in the FNPRM. For instance, installation costs can be varied by terrain and density zones, and installation costs in difficult terrain are

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decrease maintenance costs consistent with these climate differences.

6 Id. at para. 59.

increased as the default, rather than installing longer cable to route around the difficult terrain.[7] Finally, Hatfield 4.0 includes costs per foot of conduit installation that vary by density zone.[8]

AT&T and MCI agree with the Commission's finding that density zones should be defined by lines per square mile rather than households per square mile, because the economies of scale that occur in a network depend more on the number of lines in place than on the number of households.[9] Households may differ greatly in their use of the telephone network, with some houses having no telephone service and others having several lines for voice, fax, and on-line services. In addition, relying solely on households per square mile may ignore the number of business lines in an area, and the resulting economies of scale that are available. Thus, lines per square mile is a more relevant measure of density than households per square mile.

The nine density zones used in Hatfield 4.0 accurately reflect cost differences.[10] In principle, the more zones used in a model the more accurate will be the costs estimated by the model. However, it is also true that increasing the number of zones in a model creates a need for increasingly granular zone-specific

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7 Id. at para. 65-66. Hatfield 4.0 also retains the option of adding cable to go around the difficult terrain if the modeler wishes.

8 Id. at para. 67.

9 Ibid.

10 Ibid.

input data. Thus, there is always a trade-off between the number of zones and the problems of getting accurate input data for the zones. Nine zones, as used in Hatfield 4.0, adequately capture the relevant differences in cost characteristics. There are zones which are primarily rural (0-5, 5-100, 100-200 lines per square mile, corresponding to lots of approximately 3 acres and more), primarily suburban (200-650, 650-850, and 850-2550 lines per square mile, corresponding to lots of between 3 and one quarter acres), and primarily urban (2,550-5,000, 5,000-10,000, and 10,000+ lines per square mile, corresponding to lots of less than a quarter acre). These zones are sufficiently granular, while simultaneously being broad enough to allow reasonable variations in input values to be specified.

The Commission seeks comment on how to calculate the forward-looking economic cost of conduit installation, specifically asking whether national statistical averages of contractor construction prices could be used.[11] Hatfield 4.0, as described in the Hatfield Inputs Portfolio provided as documentation with the model, relies on outside plant expert opinion, data from a book providing construction cost estimates,[12] and data on contractor bids that validate its estimates of conduit installation costs. These sources, which are based on recent conduit system installations, can be used to verify the reasonableness of default conduit placement costs used in the model.

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11 Id. at para. 67-8.

12 See Martin D. Kiley and Marques Allyn, eds., 1997 National Construction Estimator 45th Edition.

The Commission asks whether a labor cost variable should be included in the cost of installation, to reflect differences in labor costs for different regions of the country.[13] AT&T and MCI will address the extent to which labor costs should vary by region in their comments in the inputs portion of this proceeding. We note that the Hatfield model has the flexibility to allow such a regional adjustment, with a user-definable input which allows a different regional multiplier to be applied to the labor costs of plant installation.

Finally, the Commission tentatively concludes that material and installation costs should be separately identified in the model.[14] AT&T will revise the Hatfield Inputs Portfolio with the next release of the model to separately identify these costs.

IV. UNLESS BOTH CUSTOMER AND ROAD LOCATIONS ARE PRECISELY KNOWN, "ESTIMATED" DROP LENGTHS WILL LIKELY YIELD EXCESSIVE DROP LENGTH ESTIMATES (III.C.2.c DROPS)

The Commission asks whether drop lengths should be estimated, or assumed, and, if estimated, what the factors determining drop length should be.[15] AT&T and MCI believe it is more accurate to use assumed drop lengths, unless customer and road locations are precisely known. None of the cost models currently is engineering to the exact location of each house, i.e., neither model knows where within each lot the house lies or how much empty space, such as

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13 FNPRM at para. 68.

14 Ibid.

15 Id. at para. 74.

roads, parking lots, or greenways, is interspersed between houses. Thus, the Hatfield Model assumes that the drop length will vary by density zones, with the two least dense zones having average drop lengths of 150 feet, the next two zones having average drop lengths of 100 feet, and the remaining five zones having average drop lengths of 50 feet.

Since the model operates on average costs within density zones, no exact computation for the drop length of each house is necessary. In addition, since the models do not determine where each house is, there is no need (or capability) to determine drop lengths other than by averages. As documented in the Hatfield Inputs Portfolio, the latest publicly available network study that includes data on drop lengths found an average drop length of 73 feet.[16] This distance is consistent with the assumed drop lengths included as default values in the Hatfield model.

If the Commission nevertheless decides to estimate drop lengths, it must determine a number of relevant inputs before it can do so. In general, drop lengths are determined by building set-backs and lot depth. Thus, the model would have to determine the placement of houses within lots. AT&T and MCI believe that houses are usually placed closer to the front of the lot, for several reasons. First, people want bigger back than front yards, because most gardens and other private spaces are in back yards. Second, people for the most part do not want long driveways, both because of the cost of surfacing long driveways, and, in non-

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[16] See Bellcore, BOC Notes on the LEC Networks - 1994, page 12-9.

Sunbelt areas, because of the problem of removing snow.

In addition to deciding these two issues to estimate the drop length, the Commission would have to determine the angle at which the drop meets the house. If, for example, a house is set on a lot that is 150 feet deep with 75 feet of road frontage, with the house set back 50 feet from the street,[17] the drop length would be 50 feet if the drop is perpendicular to the street, but could be as much as 62.5 feet if the drop runs from the corner of the lot to the middle of the lot, i.e., 50 feet from the street and 37.5 feet from the corner of the lot. In fact, if the drop were assumed to run from the corner of the lot to the house, the Commission would have to specify both the width of the house and how far back from the street the house is set in order to estimate the drop length.[18]

The Commission tentatively concludes that drop costs include installation, terminal, splice, and pedestal costs.[19] Hatfield 4.0 explicitly includes each of these items. Thus, the Hatfield model conforms to this conclusion of the Commission.

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17 This is an approximately quarter acre lot, twice as deep as it is wide, with the house set back one third of the depth of the lot.

18 This specification would have an even greater effect in rural areas. For example, a house placed in the middle of a square lot on a 200 acre farm would require a 3,300 foot drop. This exceeds by far the maximum recommended drop length of 700 feet. See AT&T Outside Plant Engineering Handbook, August 1994, p. 14-54 & p. 14-56.

19 FNPRM at para. 75.

V. STRUCTURE SHARING PERCENTAGES SHOULD REFLECT THE POTENTIAL FOR SHARING, NOT THE LECS' EMBEDDED PRACTICE (III.C.2.d STRUCTURE SHARING)

The Commission tentatively concludes in the FNPRM to adopt the BCPM's categories for installation activities and terrain categories.[20] This includes separate categories of cost for installations in normal soil, soft rock, and hard rock, which vary by density zone. For buried cable, the user can input costs separately for plowing, rocky plowing, trenching and backfilling, rocky trenching, backhoe trenching, hand digging trench, boring cable, pushing pipe and pulling cable, cutting and restoring asphalt, cutting and restoring concrete, and cutting and restoring sod. For underground cable, the user can input costs separately for trenching and backfilling, rocky trenching, backhoe trenching, hand digging trench, boring, cutting and restoring asphalt, cutting and restoring concrete, and cutting and restoring sod. Finally, for aerial cable, the user can input costs separately for poles and anchors and guys. For each of these cost categories, the user can input different values for feeder and distribution,[21] the cost per unit, the percent of installations in which the activity is used, and the percent assigned to the telephone company.

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20 Id. at para. 79

21 In many cases the default values used in the BCPM for feeder and distribution are the same.

This general methodology has been incorporated into Hatfield 4.0.[22] Based on the user inputs described supra, with the default values documented in the Hatfield Inputs Portfolio (which differ from those proffered by the BCPM's sponsors), Hatfield 4.0 computes a weighted average cost of installation.

At present, the Hatfield Model determines the cost for cable placements in hard rock and soft rock by applying multiplicative factors to the total excavation and restoral costs for normal soil. Because only excavation costs should be affected by the type of soil, the Hatfield Model sponsors are preparing a revision to the Hatfield model which will apply an additional factor only to excavation costs, not to restoral costs.

The Commission also tentatively concluded that 100% of buried and 66% of underground and aerial installation costs should be assigned to the telephone company.[23] The HM Sponsors believe this tentative conclusion is seriously wrong. At a minimum, it is inconsistent with record evidence cited by the Commission itself in the FNPRM, in which GTE states that it pays for 97.5% of buried plant, 95% to 99% of underground plant, and 57% to 61% of aerial plant in its territory.[24] In

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22 Because these costs vary by density zone, the same nine density zones will be used, to accurately reflect cost differences as discussed supra.

23 Id. at para. 80-1.

24 Id. at fn. 118, citing GTE Model comments at 72. These data should be considered an upper limit of the assignment to the telephone company, because they reflect the embedded base of a LEC whose plant was largely installed while under a regime of rate-of-return regulation, rather than the forward-looking efficient level of sharing that will exist as local exchange markets become more competitive.

addition, the claim that no sharing of buried plant is possible is refuted by the ex parte evidence recently filed by AT&T and MCI, which showed that cable plows do in fact bury more than one cable simultaneously.[25] That this sharing occurs is further supported by the deposition of U S West witness Genie Cervarich in Washington State, in which she stated, "Power is plowing in and we're going in the plow with them."[26] It also ignores the evidence, cited in the Hatfield Inputs Portfolio, that builders often provide trenching in new sub-divisions for use by cable, electric, and telephone companies, to facilitate placement of wires and to minimize cable cuts.[27] In this case, the telephone company pays none of the cost of trenching. Finally, it ignores the statement by Anchorage Telephone Utility that it shares trench space with two local electric companies.[28]

Given all of this evidence, it is clear that the cost model should not assign 100 percent of buried costs to the telephone company. At a minimum, the

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25 See Ex Parte Letter from Chris Frentrup, MCI, to William F. Caton, September 18, 1997, CC Docket Nos. 96-45 and 97-160.

26 See Deposition of Genie Cervarich, 4-18-97, at page 41, in Pricing Proceeding for Interconnection, Unbundled Elements, Transportation and Termination, and Resale, Docket Nos. UT-960369, UT-960370, and UT-960371.

27 See Hatfield Inputs Portfolio, August 1, 1997 edition, page 16 and Appendix B, pages 131-132, attached to Ex Parte Letter from Richard N. Clarke, AT&T, to William F. Caton, August 5, 1997, CC Docket No. 97-160 (Hatfield Inputs Portfolio).

28 See Request for Partial Waiver of Data Submission, CC Docket No. 96-45, filed by Anchorage Telephone Utility, August 8, 1997. ATU states that it is billed for 45 percent of the trenches.

Commission should first examine the LECs' written engineering policies to determine how much sharing of buried plant they are currently attempting to achieve in new installations. This should indicate the minimum sharing of buried plant that is possible on a forward-looking basis.

Similarly, the assumption that 66% of aerial cable cost is borne by the telephone company is inconsistent with several sources cited in the Hatfield Inputs Portfolio,[29] i.e., (1) New York Telephone reports that almost 63 percent of its pole inventory is jointly owned;[30] (2) in the same proceeding, Niagara Mohawk Power Company reported that 58 percent of its pole inventory was jointly owned;[31] and, (3) financial statements of the Southern California Joint Pole Committee indicate that telephone companies hold approximately 50 percent of all pole units.[32]

In addition, this conclusion ignores the likelihood that carriers will face greater incentives to share structure costs in the future, as they must lower their costs in order to compete.

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29 Hatfield Inputs Portfolio at 130.

30 New York Telephone's Response to Interrogatory of January 22, 1997, Case 95-C-0341: Pole Attachments, State of New York Public Service Commission, January 27, 1997.

31 Direct Panel Testimony of Richard Wolf, Clay T. Whitehead, Donald Fiscella, David Peacock and Dr. Miles Bidwell on Behalf of the Electric Utilities, Case 95-C-0341: Pole Attachments, State of New York Public Service Commission, January 27, 1997. These experts also predicted that sharing of poles among six attachers would not be uncommon.

32 "Statement of Joint Pole Units and Annual Pole Unit Changes by Regular Members", Monthly Financial Statements of the Southern California Joint Pole Committee, October, 1996.

The sharing percentages adopted in the model should reflect forward-looking opportunities. The incumbent LECs' current level of sharing represents merely the minimum that is achievable. In fact, sharing should rise, both because of the greater incentives to reduce costs and because of the increase in the number of entities with whom to share structure costs. Finally, a number of jurisdictions have adopted requirements that any carrier who wishes to dig up a street to lay cable must notify other parties, and any carriers that do not lay cable at that time are prohibited from opening that street again for a period of time.

VI. THE MODEL'S LOOP DESIGN SHOULD REPRESENT THE MOST EFFICIENT METHOD OF PROVIDING THE SPECIFIED SERVICES (III.C.2.e LOOP DESIGN)

One significant difference between the Hatfield model and the BCPM has been in their respective approaches to distribution and feeder design. While both rely on similar configurations of feeder plant extending from central offices, tapering down to sub-feeder and distribution plant, the BCPM overbuilds its network to be capable of providing services far more elaborate than those meeting the Commission's specifications for supported universal services. The Hatfield model, on the other hand, uses a network design that is fully capable of providing the level of service required by the Commission, without over-building the network to provide services beyond those for which support is intended.

a. THE COMMISSION SHOULD ADOPT A PERFORMANCE RATHER THAN A NETWORK STANDARD (III.C.2.e.(1) & (2) FIBER-COPPER CROSSOVER POINT & LOOP STANDARDS)

The Commission asks whether it should specify a network standard that the models should meet, such as the Revised Resistance Design (RRD) or Carrier Serving Area (CSA) standards, or whether it should specify a performance standard, and let the model select the network standard which will meet that performance standard.[33] AT&T and MCI support the use of a performance standard.

To build a cost model, the modelers must first know what level of service the network is intended to provide. The Commission has specified the performance standard it desires -- a network that can provide voice grade service, but which is also capable of supporting advanced services.[34] The cost model it adopts in this proceeding should be able to meet this standard at the lowest cost. Thus, the Commission need not specify a particular network standard, as that would limit the ability to use the most efficient alternative, or require the Commission to revisit its choice of model, should a new network standard become available in the future.

If the Commission does decide to specify a network rather than a performance standard, it should select the standard that will be able to meet its adopted performance standard in the most efficient manner possible. Of the two standards the Commission proposes in the FNPRM, the RRD standard will be the lower cost methodology to supply services up to at least the level of ISDN-BRI

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33 FNPRM at para. 89.

34 See Federal-State Joint Board on Universal Service, CC Docket No. 96-45, *Report and Order*, FCC 97-157, released May 8, 1997, (USF Order) at para. 250, criterion 1.

digital subscriber loops, and will not require excessive use of digital loop carrier. Furthermore, it will not allow cross-subsidization of a network capable of providing additional services, such as video dial tone, by a universal service fund that is intended to ensure that all people in the United States have access to a reasonably priced telephone line capable of supporting advanced services.[35]

b. THE COMMISSION SHOULD ADOPT HATFIELD 4.0'S DESIGN FOR DISTRIBUTION AND FEEDER (III.C.2.e(3) DIGITAL LOOP CARRIERS)

The BCPM over-engineers its network by placing fiber further out into the network than is necessary or cost-effective to provide quality service, thus requiring placement of excessive numbers of digital loop carriers (DLCs) in the network. This vastly inflates the cost of providing universal service. The approach in Hatfield 4.0 is preferable, because it uses a more economic mix of fiber and copper, thus minimizing the number of required DLCs. Hatfield 4.0 extends fiber feeder to the center of the Census Block Group (CBG)[36] if the feeder is greater than 9 kilofeet,

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35 The Commission also tentatively concludes that substituting increased use of optical fiber to restrict copper loops to a maximum of 18 kilofeet is preferable to using load coils. FNPRM at para. 87. Although Hatfield 4.0 no longer includes load coils in its network design, AT&T and MCI note that they do not believe that loops with load coils are incapable of supporting high-speed modems, as the Commission indicated in its decision. In fact, the Commission has not addressed an ex parte filed by AT&T which provided data from an independent modem testing laboratory that demonstrated that loops with load coils would in fact be capable of supporting high-speed modems. See Ex Parte Letter from Richard N. Clarke, AT&T, to William F. Caton, April 8, 1997, CC Docket Nos. 96-45 and 96-262.

36 The next release of Hatfield will engineer outside plant based on clusters of customers rather than CBGs. Fiber will always be extended to the cluster

or if total copper feeder plus distribution is greater than 18 kilofeet. From the center of the CBG, copper distribution of greater than 18 kilofeet will cause the Hatfield model to extend fiber to the center of quadrants in the CBG. From there, any distribution that extends greater than 18 kilofeet is provided over digital T-1 on copper, with repeaters as necessary, attached to 24-line DLCs.

The Hatfield model sponsors examined the use of High bit-rate Digital Subscriber Line (HDSL) over copper as a solution to the problem of long copper loops, and determined that this technology was not cost-effective for universal service, because it requires costly repeaters every 12 kilofeet.[37] Furthermore, for loops which extend more than 36 kilofeet, HDSL would require the use of dual HDSL terminals, because repeaters are unable to boost the signal to acceptable levels at those distances. Thus, Hatfield's copper T-1 technology represents the most economical method of provisioning digital quality service to distant customers in those rare cases (much less than 1 percent of total loops) in which the copper portion of loops exceeds 18 kilofeet.

The Commission also seeks comment on whether more than two sizes of DLC should be used, especially DLCs smaller than are assumed by either model.

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if the distance criteria discussed in the text are met. In addition, the model will compare the cost of fiber and copper in all areas, and use the lower cost option.

37 HDSL systems appear to be optimized toward the delivery of channels to individual subscribers that are much higher in bandwidth (e.g., 384 kbps, 768 kbps, or 1536 kbps) than the typical 64 kbps voice grade digital channel.

Hatfield 4.0 uses DLC remote terminals of eight sizes.[38] It also allows the user to input the line threshold at which the model installs a larger size fiber-fed DLC, so the model can accommodate any size DLC that is available.[39] Our information also indicates that the capacity of small DLCs can be increased in modular fashion without greatly changing the cost per line. Finally, the DLCs used by the Hatfield model allow a longer, more economical reach on copper distribution loops because they transmit against resistances up to 1500 ohms.[40] The DLCs specified in the BCPM will not do so, because they appear to mistakenly assume a 900 ohms limit, which triggers the placement of far more fiber-fed DLC remote terminals.

VII. BASING UNIVERSAL SERVICE SUPPORT ON A WIRELINE MODEL FOR THE PRESENT WILL NOT DISTORT FUNDING (III.C.2.f WIRELESS THRESHOLD)

The Commission asks several questions regarding the use of wireless or other technology as an alternative. Specifically, it asks (1) whether any loop with more than $10,000 investment, as reflected in the BCPM, could be more

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38 DLC Remote Terminal increments are in maximum line sizes of 2016, 1344, 672, 384, 288, 192, 96, (all fiber fed) and 24 (copper T-1 fed).

39 The default value in Hatfield 4.0 of 384 lines to trigger the larger 672-line DLC is based on a calculation of the most cost effective break-even point. Up to that user-specified breakpoint, the Hatfield Model adds lines to the DLC in 96 line increments.

40 See, e.g., DSC Communications Litespan-2000 Specifications for POTS cards: "Up to 224 lines per channel bank, 4 lines per POTS card, Loop Resistance of 1930 ohms (including set)." Subtracting 430 ohms from this for the assumed station resistance (cf. Bellcore, BOC Notes on the LEC Networks - 1994, page 7-67) leaves 1500 ohms.

economically served by a wireless system;[41] (2) whether the cost of wireless loops can be estimated;[42] (3) whether basing universal service support on the costs of wireline technology alone would be consistent with the requirement that support be technology neutral;[43], and (4) whether the cost model adopted in this proceeding should model the cost of other technologies as well, such as microwave and satellite.[44]

AT&T and MCI agree that, in principle, the cost model should reflect all technological alternatives, selecting the lowest-cost option to compute universal service support. However, to be done correctly, such a model would require development of cost models for each technology, rather than the simple $10,000 cap on investment assumed in the BCPM. For example, because there is a large fixed cost component of wireless systems, the size of the customer base served by a wireless system will have an effect on the per-customer cost. In addition, any alternative technology modeled would have to be engineered so that it would be capable of achieving the level of service required to receive universal service support, e.g., wireless services would have to be capable of supporting the same

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41 FNPRM at para. 98.

42 Id. at para. 99.

43 Id. at para. 101.

44 Id. at para. 102.